Similar equations are to be formed for the remaining five subdivisions of $P(x+k+l,\ k+l)$.

Of the products under Σ, the first factors are found by the preceding part of the process, and the second are given by the equations above written as solutions of the problem. The factors will of course frequently be zeros. Finally, if $x'=x+k+l$,

$$P_{x+k+l}=P_{x'}=P(x',2)+P(x',3)+\ldots.+P(x',\tfrac{1}{2}(x'-1)).$$

Thus, to give an example,

$$\begin{aligned}
P_{11}&=P(11,2)+P(11,3)+P(11,4)+P(11,5)\\
&=I(11,2)+I(11,3)+I(11,4)+(I(11,5)=0)\\
&\quad+I^2(11,2)+I^2(11,4)\\
&\quad+R(11,2)+R(11,3)+R(11,4)+R(11,5).\\
I(11,2)&=I^2(9,2).II^2(9,2,0)+I(9,2).II(9,2,0);\\
I(11,3)&=I(8,2).II(8,2,1)+R(8,2).IR(8,2,1)+I(8,3).I(8,3,0);\\
I(11,4)&=I^2(7,2).II^2(7,2,2)+R(7,2).IR(7,2,2)\\
&\qquad+R^3(7,3).IR^3(7,3,1);\\
I^2(11,2)&=I^2(9,2).I^2I^2(9,2,0);\\
I^2(11,4)&=I^2(7,2).I^2I^2(7,2,2);\\
R(11,2)&=R(9,2).RR(9,2,0);\\
R(11,3)&=R(8,2).RR(8,2,1);\\
R(11,4)&=R(7,2).R(7,2,2)+R^3(7,3).RR^3(7,3,1);\\
R(11,5)&=R(6,2).RR(6,2,3).
\end{aligned}$$

The result is

$$P_{11}=I_{11}+I_{11}^2+R_{11}=61+7+12=80.$$

XV. "Notes on British Foraminifera." By J. Gwyn Jeffreys, Esq., F.R.S. Received June 19, 1855.

Having, during a great many years, directed my attention to the recent Foraminifera which inhabit our own shores, I venture to offer a few observations on this curious group, as Dr. Carpenter, who has favoured the Society with an interesting and valuable memoir on the subject, seems not to have had many opportunities of studying the animals in the recent state.

Rather more than twenty years ago I communicated to the Linnean Society a paper on the subject, containing a diagnosis and figures of all the species. This paper was read and ordered to be printed in the Transactions of that Society; but it was withdrawn by me before publication, in consequence of my being dissatisfied with D'Orbigny's theory (which I had erroneously adopted), that the animals belonged to the Cephalopoda; and my subsequent observations were confirmed by the theory of Dujardin. I have since placed all my drawings and specimens at the disposal of Mr. Williamson of Manchester, who has given such a good earnest of what he can do in elucidating the natural history of this group, by his papers on *Lagena* and the Foraminiferous mud of the Levant.

The observations which I have made on many hundred recent and living specimens of various species, fully confirm Dr. Carpenter's view as to the simple and homogeneous nature of the animal. His idea of their reproduction by gemmation is also probably correct; although I cannot agree with him in considering the granules which are occasionally found in the cells as ova. These bodies I have frequently noticed, and especially in the *Lagenæ*; but they appeared to constitute the entire mass, and not merely a part of the animal. I am inclined to think they are only desiccated portions of the animal, separated from each other in consequence of the absence of any muscular or nervous structure. It may also be questionable if the term "ova" is rightly applicable to an animal which has no distinct organs of any kind. Possibly the fry may pass through a metamorphosis, as in the case of the Medusa.

Most of the Foraminifera are free, or only adhere by their pseudopodia to foreign substances. Such are the *Lagena* of Walker, *Nodosaria, Vorticialis* and *Textularia*, and the *Miliola* of Lamarck. The latter has some, although a very limited, power of locomotion; which is effected by exserting its pseudopodia to their full length, attaching itself by them to a piece of seaweed, and then contracting them like india-rubber, so as to draw the shell along with them. Some of the acephalous mollusks do the same by means of their byssus. This mode of progression is, however, exceedingly slow; and I have never seen, in the course of twenty-four hours, a longer journey than a quarter of an inch accomplished by a *Miliola*, so that, in comparison with it, a snail travels at a railroad pace.

Some are fixed or sessile, but not cemented at their base like the testaceous annelids. The only mode of attachment appears to be a thin film of sarcose. The *Lobatula* of Fleming, and the *Rosalia* and *Planorbulina* of D'Orbigny belong to this division.

Dr. Carpenter considers the Foraminifera to be phytophagous, in consequence of his having detected in some specimens, by the aid of the microscope, fragments of *Diatomaceæ* and other simple forms of vegetable life. But as I have dredged them alive at a depth of 108 fathoms (which is far below the Laminarian zone), and they are extremely abundant at from 40 to 70 fathoms, ten miles from land and beyond the range of any seaweed, it may be assumed without much difficulty, that many, if not most of them, are zoophagous, and prey on microscopic animals, perhaps even of a simpler form and structure than themselves. They are in their turn the food of mollusca, and appear to be especially relished by *Dentalium Entale*.

With respect to Dr. Carpenter's idea that they are allied to sponges, I may remark that *Polystomella crispa* (an elegant and not uncommon species) has its periphery set round at each segment with siliceous spicula, like the rowels of a spur. But as there is only one terminal cell, which is connected with all the others in the interior by one or more openings for the pseudopodia, the analogy is not complete, this being a solitary, and the sponge a compound or aggregate animal.

I believe the geographical range or distribution of species in this group to be regulated by the same laws as in the Mollusks and other marine animals. In the gulf of Genoa I have found (as might have been expected) species identical with those of our Hebridean coast, and *vice versâ*.

In common with Dr. Carpenter, I cannot help deploring the excessive multiplication of species in the present day, and I would include in this regret the unnecessary formation of genera. Another Linnæus is sadly wanted to correct this pernicious habit, both at home and abroad.

The group now under consideration exhibits a great tendency to variation of form, some of the combinations (especially in the case of *Marginulina*) being as complicated and various as a Chinese puzzle. It is, I believe, undeniable, that the variability of form is in an inverse ratio to the development of animals in the scale of Nature.

Having examined thousands (I may say myriads) of these elegant organisms, I am induced to suggest the following arrangement:—

1. *Lagena* (Walker) and *Entosolenia* (Williamson).
2. *Nodosaria* and *Marginulina* (D'Orb.), &c.
3. *Vorticialis* (D'Orb.), *Rotalia* (Lam.), *Lobatula* (Flem.), *Globigerina* (D'Orb.), &c.
4. *Textularia* (Defrance), *Uvigerina* (D'Orb.), &c.
5. *Miliola* (Lam.), *Biloculina* (D'Orb.), &c.

This division must, however, be modified by a more extended and cosmopolitan view of the subject, as I only profess to treat of the British species. To illustrate MacLeay's theory of a quinary and circular arrangement, the case may be put thus.

The first family is connected by the typical genus *Lagena* with the second, and by *Entosolina* with the fifth; the second is united with the third through *Marginulina*; the third with the fourth through *Globigerina*; and the fourth with the last through *Uvigerina*.

Whether these singular and little-known animals are Rhizopodes, or belong to the Amœba, remains yet to be satisfactorily made out.

London, June 18, 1855.

XVI. "Preliminary Research on the Magnetism developed in Iron Bars by Electrical Currents." By J. P. Joule, F.R.S. Received June 21, 1855.

The author had, many years ago, found that the magnetism developed by electro-magnetic coils in bars of upward of $\frac{1}{3}$rd of an inch